Innovative Projects

Summer 2015

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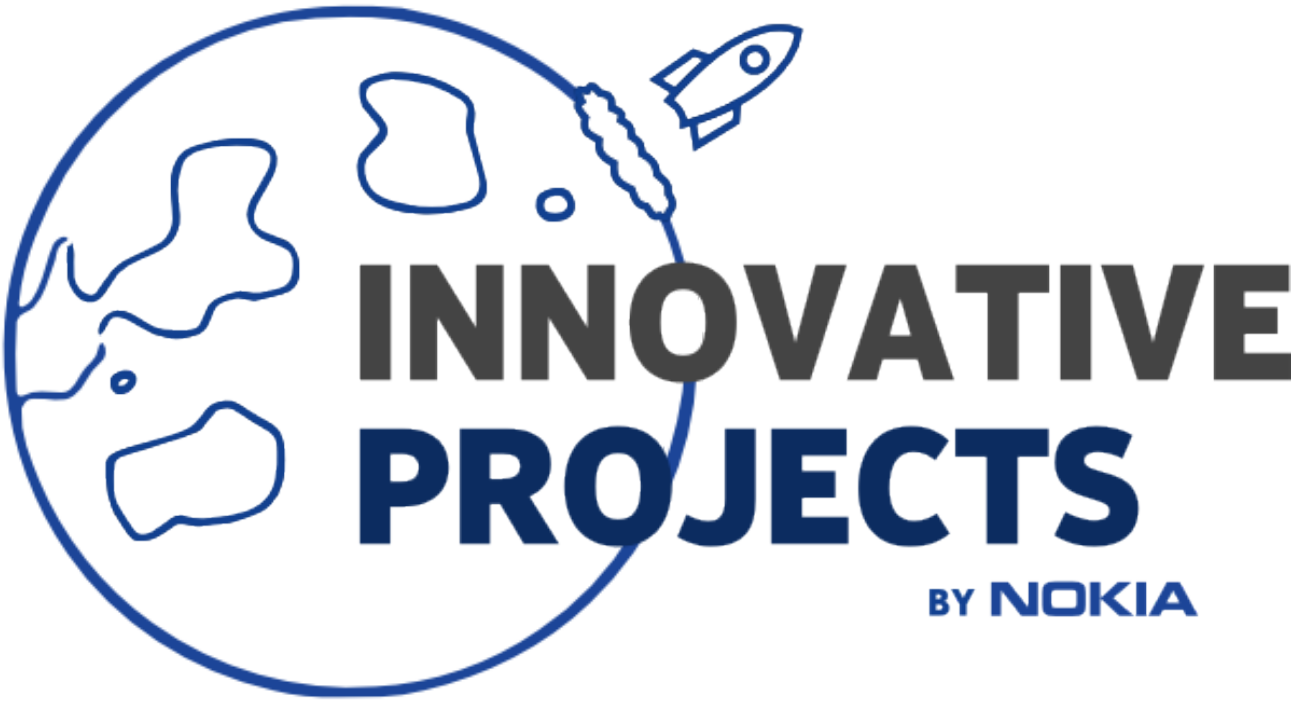

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List of projects

LTE network simulator . . . 3

Handover testing tool based on empirical propagation models . . . 3

Lightweight C++11 code model . . . 3

Competence map . . . 4

Lost signal . . . 5

Smart, memory-saving collections in Java . . . 6

Optimal subset . . . 6

GPS waker-upper . . . 7

Pomodoro device . . . 7

Help! . . . 8

Big Data spreadsheet . . . 8

Ad hoc search engine . . . 9

Network Simulator . . . 9

SQL unit . . . 10

Website branding validator . . . 10

OCR for graphs and structured data . . . 11

Augmented notification system . . . 12

Knowledge-based Expert System simulation environment . . . 13

Eclipse plugin - Logs parser . . . 13

Acceptance tests framework for JS-heavy web applications . . . 14

Jenkins: deployment plugin . . . 15

Jenkins build trigger . . . 15

Performance tests plugin for Jenkins . . . 16

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#1	LTE network simulator
Project goals	Help novice to understand message flow in cellular network
Scope definition	Create web application visualizing message flow in cellular network. Starting from one LTE base station and one cell phone visualize what messages are exchanged between them in situation like: UE start up, phone call, SMS, web browsing, etc.
Requirements	At least one team member with telecommunication knowledge.
Author	Marek Kukulski
Planned duration	1 semester
Team size	2-5

#2	Handover testing tool based on empirical propagation models
Project goals	The tool will allow to test handovers in more realistic conditions.
Scope definition	Develop tool with GUI interface which on the basis of: base stations locations, antenna heights, transmitting powers, mobile user movement and propagation model (e.g. Free Space, Okumura-Hata) calculates and sets attenuation of multiple programmable attenuator system (e.g. JFW 50PA-847).
Requirements	Preferred language: Python At least one team member with telecommunication knowledge.
Author	Mariusz Zamlynski
Planned duration	1 semester
Team size	1-5

#3	Lightweight C++11 code model
Project goals	Develop a plugin for Vim or Emacs which uses Clang to provide real-time syntax highlighting, code completion and error/warning indication
Scope definition	Modern C++ IDEs such as Qt Creator or Microsoft Visual Studio provide code models for real-time syntactic and semantic code analysis. This greatly enhances the programming experience, allowing for faster and more convenient development. However, sometimes developers are required to work on remote machines, e.g. via SSH. In such circumstances it is impossible to use heavy tools with sophisticated GUIs. On the other hand, console text editors do not provide satisfactory code models. Existing plugins are often difficult to configure and aimed mainly at graphical versions of the editors. They also cause significant problems when new C++11 constructs are used. The growing popularity of Clang, a modern compiler which supports the full C++11 standard and provides a convenient API, seems to indicate the possibility to provide a lightweight plugin for one of the popular console text editors such as Vim or Emacs âĂŞ one that would support real-time syntax highlighting, code completion, compiler error/warning indication. The plugin will have to be able to: - Load projects, preferably using CMake input files. - Parse the headers and source files belonging to the project as well as system libraries to provide a list of available symbols. - Perform on-the-fly code inspection, verifying its syntactic correctness and the symbols used. - Provide real-time information on types of variables, class members and function arguments. - Locate class and function declarations and definitions.
Requirements	At least one team member with telecommunication knowledge.
Author	Marek Gulanowski
Planned duration	1 semester
Team size	2-5

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#4	Competence map
Project goals	Prepare application which allows users to find people with specified experience and create their own competence maps.
Scope definition	In big company work many people with different experience and competence. The problem is, to find person which has qualification, skills or knowledge, we are looking for at the moment. Application which can hold map, tags or description of personal abilities will help many people. Application should give users such features like: - Ability to traverse through company general abilities map - Ability of create and manage own users map or maps, which can base on company map or its branch - Ability of add, move or remove people from their own competence map - Add, remove competence tags to selected people - Add, remove and edit competence description to selected persons - Ability of search people competence by tags or words in description - Display the degree if coverage tags with other users data - User friendly interface for desktops and mobile devices The project will have 3 phases: - Development - Implementation for internal use, without general company map (users can create their own maps, add tags and descriptions) - Development of aggregation tool which help to gain all knowledge about specified people and after that create general company competence map - Implement tool and create such map When user decides that his fellow has some knowledge in some discipline, he add profile of his fellow to his map. User specifies how to tag this knowledge and where he can find this person - also tag with department name or team name. When user after some time have such problem and doesn't remember how can help, he get in this application and search people with such tags.
Requirements	-
Author	Pawel Gora
Planned duration	1 semester
Team size	3-6

#5	Lost signal
Project goals	Finding closest position with the mobile network signal
Scope definition	Let assume that we are picking up mushrooms in a forest or we are climbing in the mountains. Our friend had an accident. We need to call for help. Our mobile says: *Sorry dude, no signal*. We are in a deep shit. Application could periodically test the network signal and correlate this data with our position from GPS. Then, if needed, it could lead us to the closest position with the last visible signal. Application can also consist of web service that would gather the data from other users and would allow to download the area coverage for the offline usage. It can also use maps (HERE, Google, etc.) for the localization purposes.
Requirements	-
Author	Mateusz Jaworski
Planned duration	1 semester
Team size	1-5

#6	Smart, memory-saving collections in Java
Project goals	Java library to store large objects collections in memory. Research and comparison of different techniques.
Scope definition	Create library that transparently saves memory usage of large collections. For instance: first zip objects in memory, then serialize them to disk when they are still not accessed. Try out different compression algorithms and inventory methods like LIFO, FIFO, etc.
Requirements	Java
Author	Mateusz Jaworski
Planned duration	1 semester
Team size	1-2

#7	Optimal subset
Project goals	Algorithm for finding optimal subset of elements based on given conditions

Scope definition	Database contains millions of entries with different properties. The idea is to implement solution that would be able to find minimal set of entries covering set of given rules. In the worst case (depending on rules) problem is NP hard. Rules has to be easily editable. Example conditions:
	
	`at least 60% of results has property A = 1`
	`at most 10% of results has property B in (1,3,4)`
	`at least 1 result has property C = 7`
	`at least 25% of results has property D matching /abc-.*/`

Requirements	-
Author	Rafal Mijas
Planned duration	1 semester
Team size	1-2

#8	GPS waker-upper
Project goals	Mobile waker-upper with GPS
Scope definition	Mobile application that can notify you when you are around your destination. Really helpful when you are tired in a bus or tram.
Requirements	-
Author	Jakub Stasiak
Planned duration	1 semester
Team size	1-3

#9	Pomodoro device
Project goals	Small device that would simplify using Pomodoro Technique
Scope definition	The Pomodoro Technique is a time management method (http://en.wikipedia.org/wiki/Pomodoro_Technique). The device should consist of timer and some notification system, using light, sound, etc. Plenty of imagination and innovation highly welcome.
Requirements	-
Author	Mateusz Jaworski
Planned duration	1 semester
Team size	1-2

#10	Help!
Project goals	Mobile application for calling for help in urgent cases
Scope definition	Application should consist of simple interface that would be easy to use in stress and harsh conditions. It would allow to notify family, police or call for ambulance with a few clicks. It can send sms, email or just call (voice synthesis) and provide predefined user information and GPS position. It can also contain first aid hints.
Requirements	-
Author	Mateusz Jaworski
Planned duration	1 semester
Team size	1-4

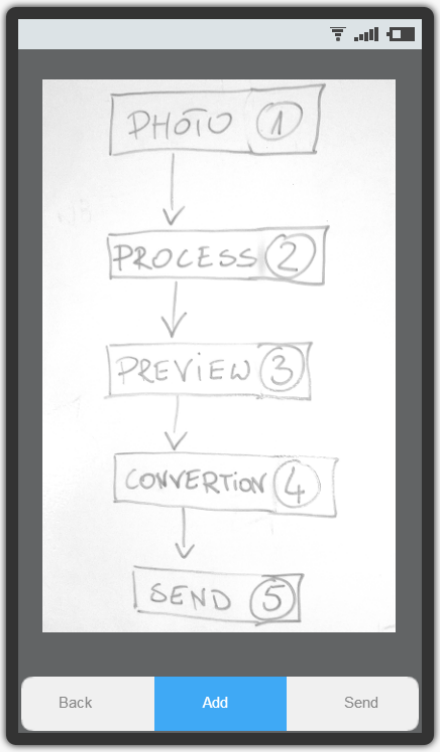
#11	Big Data spreadsheet
Project goals	Spreadsheet application for big data analysis
Scope definition	Application that would allow to override excel lack of scalability (e.g. limited number of rows/columns) and to perform excel formulas (conditions, aggregations, etc). Project can be based on Microsoft Excel, Libre Office or can be an independent application or library.
Requirements	-
Author	John Torregoza
Planned duration	1 semester
Team size	1-4

#12	Ad hoc search engine
Project goals	Application for crawling web pages in a fastly changing environment
Scope definition	Web application that would allow crawling web pages for the given set of key words. The data does not have to be stored and indexed as usually do the web search engines because of its volatility. It could support authentication on subpages with the given username and password.
Requirements	-
Author	Adam Pomykala
Planned duration	1 semester
Team size	1-4

#13	Network Simulator
Project goals	Monte Carlo simulator for mobile networks
Scope definition	Application that would allow simulating network behaviour for the given topology, UEs distribution, pathloss model and power control algorithms. It could also support different traffic models and present detailed interferention statistics.
Requirements	-
Author	Adam Pomykala
Planned duration	1 semester
Team size	1-4

#14	SQL unit
Project goals	Test framework for SQL queries and functions
Scope definition	Test framework that would allow writing unit tests for SQL code. Should be driver independent and support standard SQL syntax (but obviously additional extensions for specific database features would be welcome). Tests can be written in python, java, scala or any other language, not necessarily in SQL (probably it would not be a good idea).
Requirements	Preferred databases: MySQL, PostgreSQL
Author	Mateusz Jaworski
Planned duration	1 semester
Team size	1-3

#15	Website branding validator
Project goals	Sometimes the branding (i.e. name of company/product, logo or logotype) is changing. It would be useful to have a website crawler to walk the website and validate that all proper changes has been introduced.
Scope definition	A program in any form that will accept inputs as i.e. renames, brand colors etc and will crawl given website looking for errors in logotype or branding.
Requirements	-
Author	Mateusz Wronski
Planned duration	1 semester
Team size	1-2

#16	OCR for graphs and structured data
Project goals	Optical character recognition library for conversion of handwritten graphs and structured data into digital format. Implementation can have a form of mobile app.
Scope definition	Graphs can have some fixed form and limited number of elements to recognise, i.e. they can consist of arrows and boxes filled with text. They can be converted to any text format. For structured data you can define some abstract structure like: 'text and number in circle on the right hand side' and application should try to match those with the photo. Example: 
Requirements	-
Author	Mateusz Jaworski
Planned duration	1 semester
Team size	1-3

#17	Augmented notification system
Project goals	Composite solution for distributing notifications via light, sound and touch.
Scope definition	The system could have a form of central controller with many different peripheral devices that would be used for handling notifications and alarms. The main aim is to present status of continuous integration server in a highly visible manner. Those peripheral devices could have a form of RGB lamps, signal lights (same as used for the traffic control) or usb rocket launchers.
Requirements	-
Author	Mateusz Jaworski
Planned duration	1 semester
Team size	1-4

#18	Knowledge-based Expert System simulation environment
Project goals	Ready to use simulation environment with CLIPS production system implemented.
Scope definition	Knowledge-Based Expert System (KBES) is an artificial intelligence branch used for defining human-like reasoning, i.e. decision-making. The goal of the project is to integrate CLIPS system with some simulation environment (e.g. MATLAB), propose the object to be controlled, and define some set of production rules to test, whether it works fine enough.
Requirements	C, C++, MATLAB, CMake, general AI knowledge
Author	Pawel Ptasznik
Planned duration	1 semester
Team size	1-2

#19	Eclipse plugin - Logs parser
Project goals	Implement Eclipse plugin that parses project source code for logs printings. After loading of log file plugin is capable to jump into source code to point the place where log was printed. There are many applications in the world that generate logs in text format. It is difficult to find quickly where given log message comes from.
Scope definition	- Plugin for Eclipse to index code and parse logs - UI Eclipse configuration front-end - Jump into code after selecting particular log line - Ability to filter the log file after applying set of filters
Requirements	- Configurable log format - Configurable log print functions in code (allow support standard and custom print functions) - Jump into code after selecting particular log line - Support for C/C++ or other languages
Author	Grzegorz Kokot
Planned duration	2 semesters
Team size	2-6

#20	Acceptance tests framework for JS-heavy web applications
Project goals	Web testing framework for acceptance tests in natural language (similar/based on Cucumber) for JS-heavy (AJAX) web applications.

Scope definition	Example:
	
	`OPEN http://www.nsn.com`
	
	`TYPE 'hello' INTO .login-input`
	`TYPE 'pasword' INTO .pass-input`
	`CLICK input[type=submit]`
	
	`ASSERT SUCCESS`
	`ASSERT .status CONTAINS 'welcome'`
	`ASSERT .main-page IS VISIBLE`

Requirements	Java/C#/Python/JS
Author	Mateusz Jaworski
Planned duration	1 semester
Team size	1-3

#21	Jenkins: deployment plugin
Project goals	Plugin for web applications deployment
Scope definition	After build: - connect via ssh with remote server - copy and unzip selected artefacts - run script externally
Requirements	NodeJS/Python/Java
Author	Wojciech Stachowski
Planned duration	1 semester
Team size	1-2

#22	Jenkins build trigger
Project goals	Jenkins plugin for builds triggering based on result of database query
Scope definition	Jenkins periodically queries the database, builds are triggered when query result matches given condition
Requirements	Support for PostgreSQL, MongoDb
Author	Jacek Tomasiak
Planned duration	1 semester
Team size	1-2

#23	Performance tests plugin for Jenkins
Project goals	Jenkins plugin for execution and visualisation of performance tests' results
Scope definition	- runs JUnit tests marked with @Performance annotation - generates report in xml format - presents results on CI server
Requirements	Preferred language: Java (JUnit)
Author	Mateusz Jaworski
Planned duration	1 semester
Team size	1-2